STREETLIGHT KIT OF PARTS

California College of the Arts | DMBA | Sustainability Studio Spring 2017 | Travis Kupp / Ai Miyazawa / Shar Shahfari / Anita Wong

STREETLIGHT KIT OF PARTS

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EXECUTIVE SUMMARY

From secondary research and expert interviews, we learned that there are a great number of street lights just in the 49 square miles of the City of San Francisco. Street lights consume nearly 18,000 kWh of energy per year along with the energy maintenance costs to the City of San Francisco. While they contribute to safety and prevent unwanted incidents, there are untapped opportunities to expand on their use case through an upgraded business model. We believe that strategic redesign and placement of user centric street lights will bring great environmental and economic contributions to the city.

The Streetlight Kit of Parts is a modular system designed to benefit multiple stakeholders in an urban community. The collection of parts does not replace the streetlight infrastructure already in place, but rather enhances the value of the existing assets via leasing agreements with the owners and collection of transaction fees for use of the energy and wireless services provided to community members and visitors. The benefit to neighborhood vitality provided by the kit parts is shown through a consideration of strategic placement in three separate locations in the city of San Francisco--Alamo Square Park, Tenderloin, and Victoria Draves Park in SOMA.

1.
Why Streetlights

ABOUT STREETLIGHTS

→ Provide Safety, reduce **50%** of crashes
→ Pedestrian fatalities are **3-6.75x** more if no street lights
→ Promote **economic values**

Values of street lights are often overlooked

ADVANTAGE OF STREETLIGHTS

The advantages of street lights are apparent. Street lights is key in the prevention of pedestrian, cyclist, and vehicular accidents. **Pedestrian fatalities are 3-6.75x more likely when street lights are not present.** Street lighting has been found to **reduce crashes by about 50%.** Street lights plays a part in **promoting economic value** as well.

Cities such as the City of Oakland have incentivised developers by redesigning and placing new street lights in areas cities want to revitalize such as downtown areas or converting older parts of town. Additionally, many communities use street lights to town ambience and have been used as even possible tools for marketing and sponsorship.

46,000

STREETLIGHTS IN THE CITY OF SF

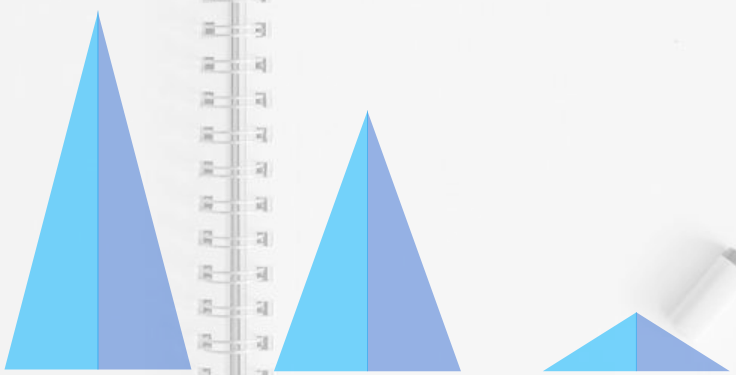
ENERGY USE

Based on the number of streetlights in the city of San Francisco, we estimate each light consumes **18,000 kWh per year** at 250 watts per hour. This estimates a cost of **$15.4M per year** for the city of San Francisco in electricity cost alone, in addition to the cost of erecting a street light which can cost **upwards of $5,000 per lamp**. Street lights contribute to 40% of a municipality's electric bill.

SAN FRANCISCO POWER MIX

- **PG&E:** Standard (~30% renewable), Green Option (50% or 100% renewable)
  Clean Power SF: Green (40% renewable), SuperGreen (100% renewable)
- **Streetlights owned by SFPUC:** Hetch Hetchy Dam (100% renewable)

MARKET ANALYSIS
-Bay Area-



Annual Energy cost

city
# of lights
population

15.4M
SF
46,000
805K

12.7M
Oakland
38,000
390K

2.6M
Berkeley
8,000
112K

*Assumption: Costs $335/light for electricity annually

Diagram featured by http://slidemodel.com

TECHNOLOGY

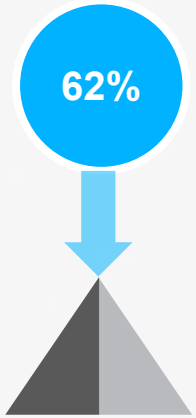
These days, street lights commonly use high-intensity discharge lamps, often HPS high pressure sodium lamps. However lights have been studied to block peripheral vision of drivers and new standards have been placed where cities are in current transition to LED lights including city of San Francisco. LED emits a white light that provides high levels of scotopic lumens which allow lower wattages and is **400% more efficient** than metal halide lamps. Oslo completed streetlight smart LED replacement project and reduced **62%** of electricity cost. LED additionally last much longer which means less cost for municipalities who serve to maintain the lights for safety.

MARKET ANALYSIS
-LED smart light implementation in Oslo-

Annual Energy cost

city
# of lights
population

18.4M
Oslo
55,000
647K



7.0M
Oslo
With LED
Installation

*Assumption: Costs $335/light for electricity annually

KEY STAKEHOLDERS

→ SF residents - 805K

→ Tourists - 24.6M

→ Local Businesses

→ City Government

→ Technology Providers

46,000 in SF

That's a lot of street lights

18,000 kWh/year

A street light consume a lot of energy

805,000+ users

Residence of SF

OPPORTUNITIES

ENVIRONMENT

Save energy

Sustainable energy source

ECONOMY

Strategic Placement

Apply business model

SOCIAL

Alternative use case

Community Engagement

Cities are already flooded with streetlights. While they contribute to safety and prevent unwanted incidents, there are untapped opportunities to expand on their use case through an upgraded business model. Some cities, including San Francisco, have made a commitment to “go green” and replace the sodium vapor lamps currently used in streetlights with LEDs to drastically reduce the energy consumed by this prevalent urban feature.

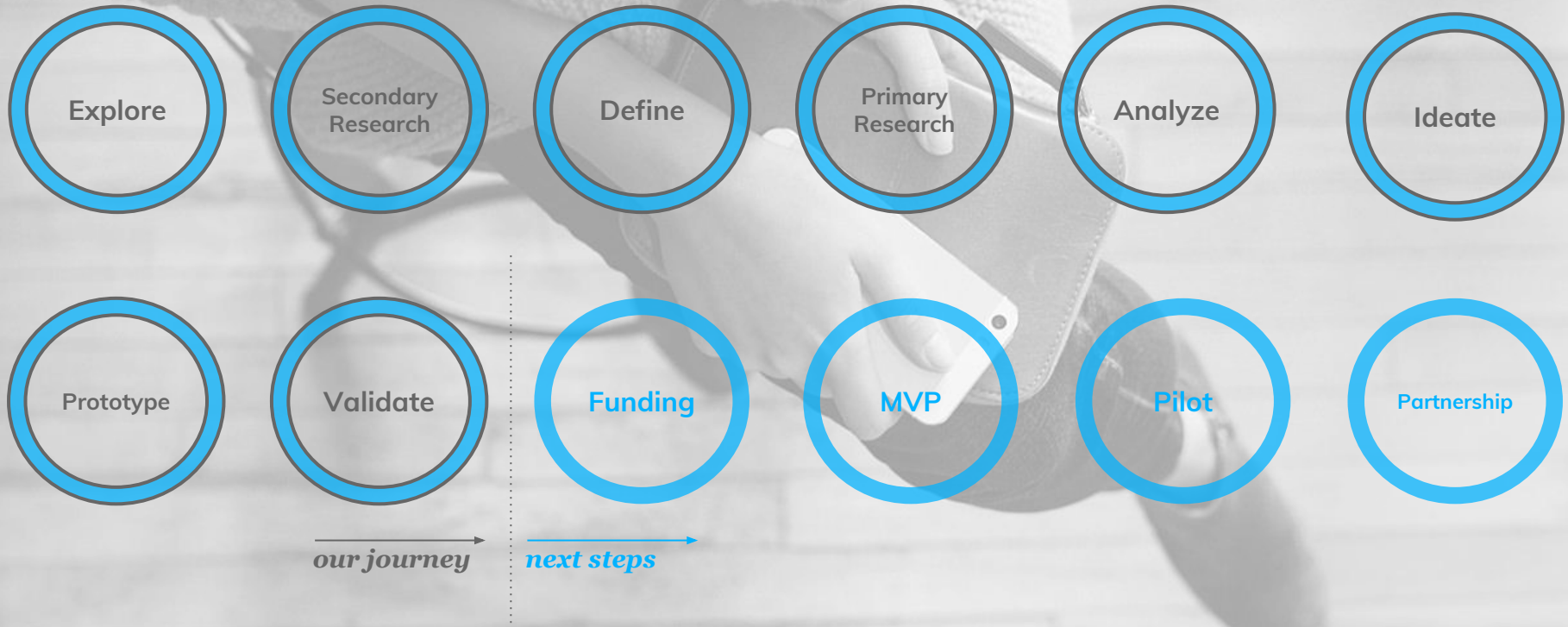
We see an even bigger opportunity to utilize streetlights in the quest for urban sustainability through designing enhancements that, when strategically placed in the context of the masterplan, bring vitality to communities.

CURRENT CHALLENGES

How might we revitalize specific communities in San Francisco, both ***economically*** *and* ***environmentally*** *through strategic redesign and placement of user centric streetlights?*


2.
Our Process

OUR PROCESS


Explore
Secondary Research
Define
Primary Research
Analyze
Ideate
Prototype
Validate
Funding
MVP
Pilot
Partnership
our journey
next steps

RESEARCH METHODS

3.
Discoveries

AHA MOMENTS

Ownership of Streetlights

Increasing desire to work outside

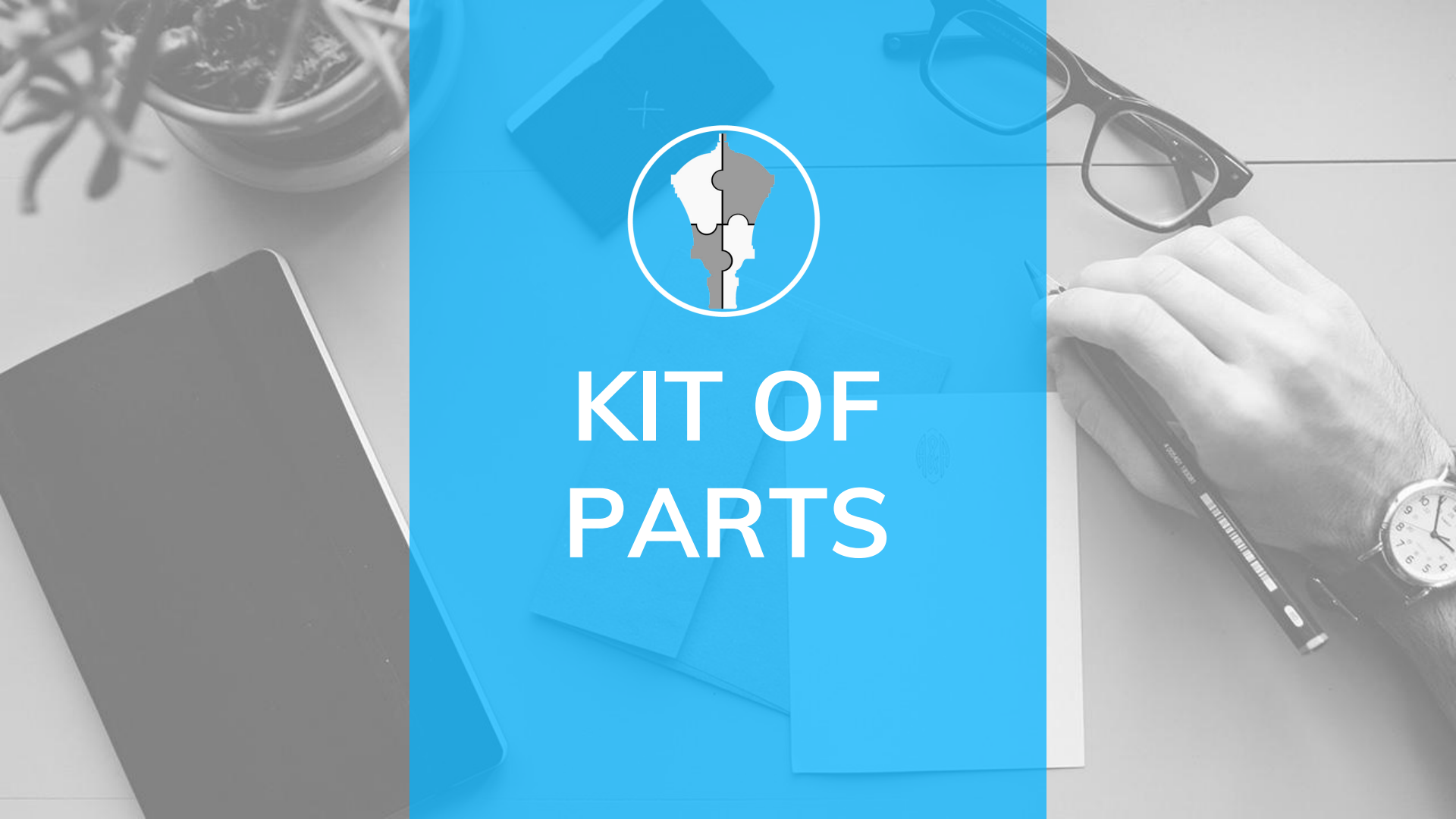
Streetlights as vertical property for rent. Totem!

SF Power Mix

Rise in real estate value

Lack of sufficient # of charging stations

4.
Our Solution



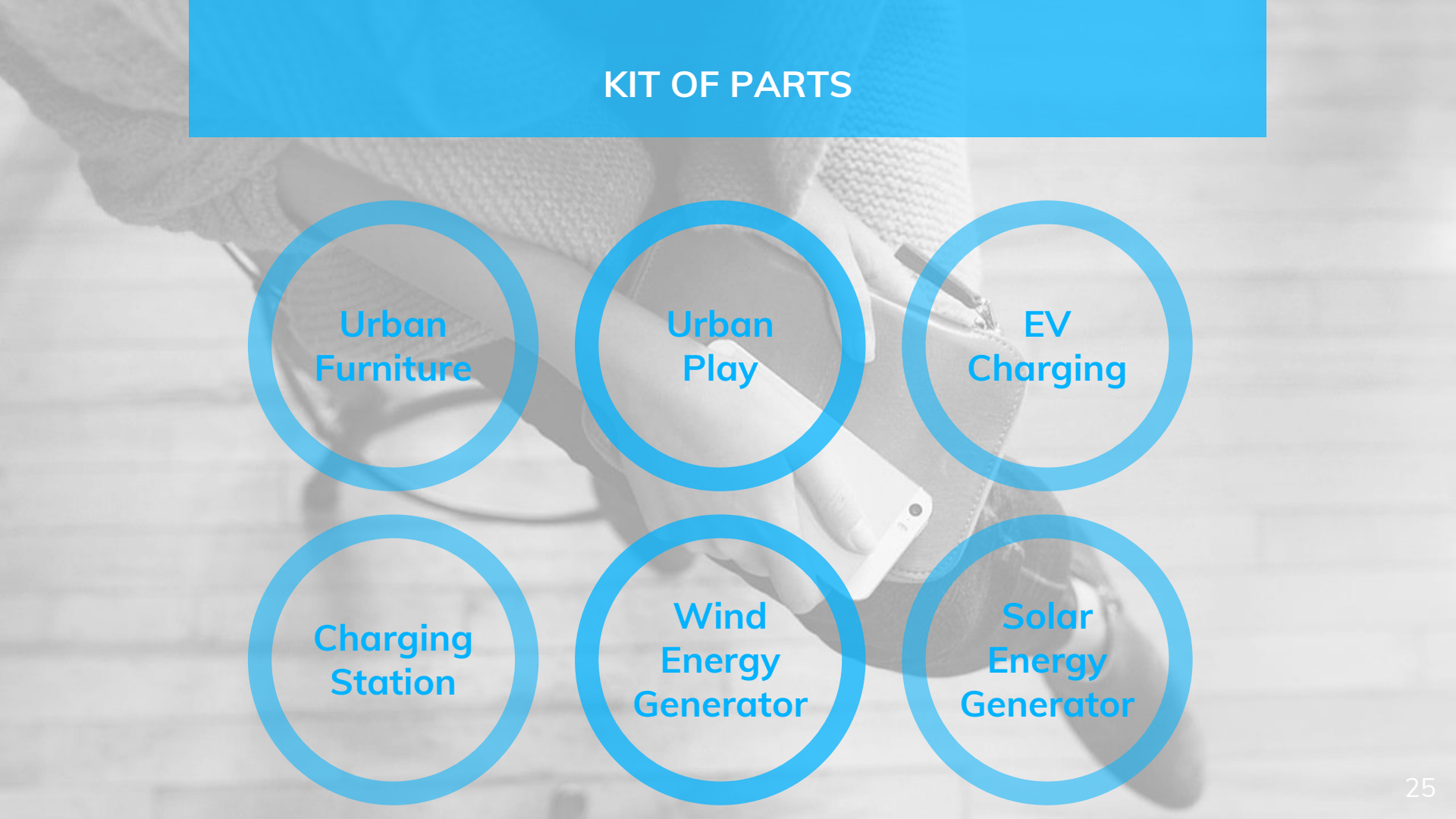
KIT OF PARTS

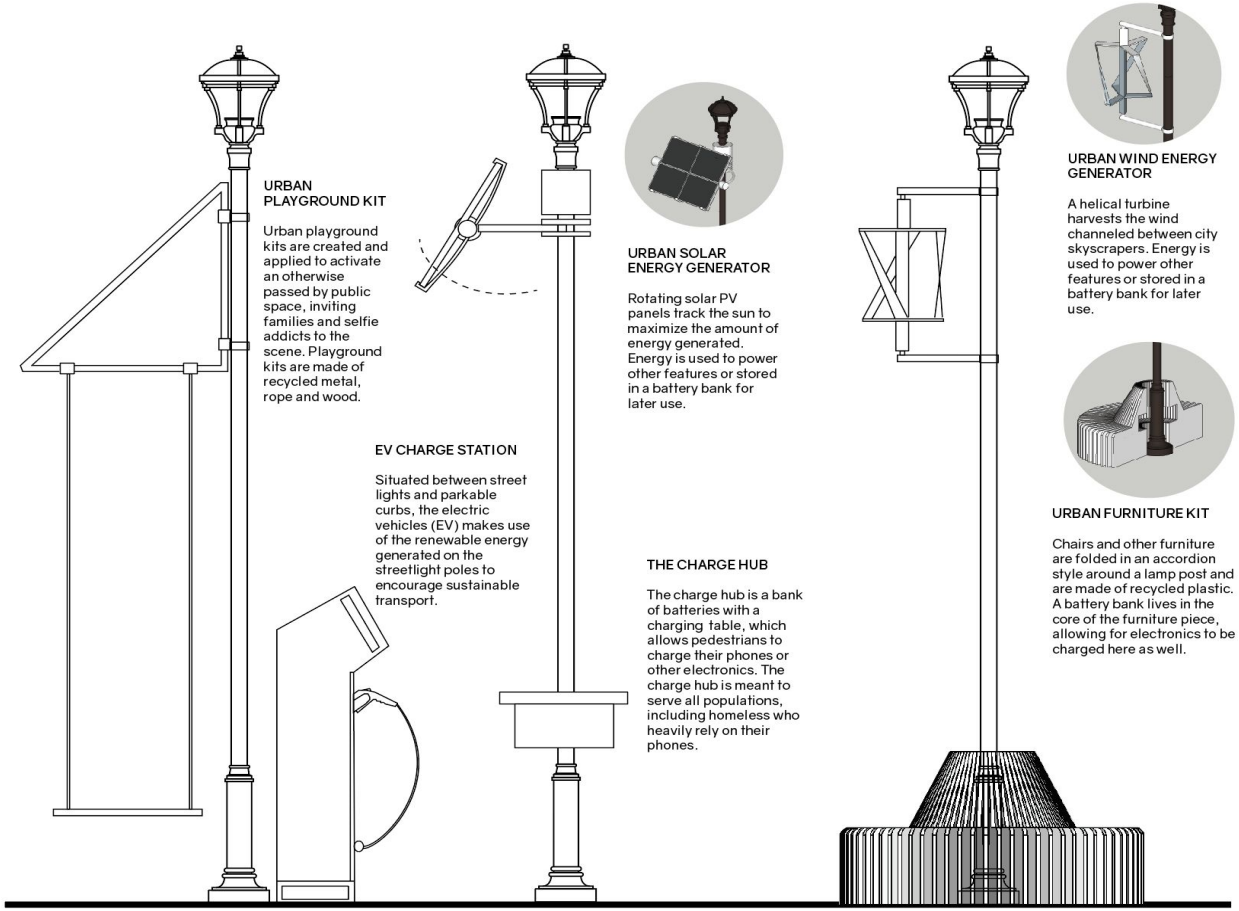
Our solution is an add-on kit that will have the capability to generate and store energy from renewable sources, provide wifi and electric outlets to residents, and increase community engagement. We plan to lease the streetlights from their owner and customize it based of the needs of their respective community.

Each city light with the add-on kits will be equipped with EV charging stations, have capability to generate and store energy from renewable sources, provide wifi and electric outlets to residents, and increase community engagement. Our model of revenue will be through user memberships, pay per use charges, advertising, and selling the excess energy to the city.

StreetLight kit of parts are the add-on to existing street lights. It gives flexibility for the owners to select specific streetlight to be leased. By providing multiple options of packages, the model promises scalability, it could fit into any cities in any geographic areas. We also use sustainably sourced or recycled materials for all our offerings.

KIT OF PARTS

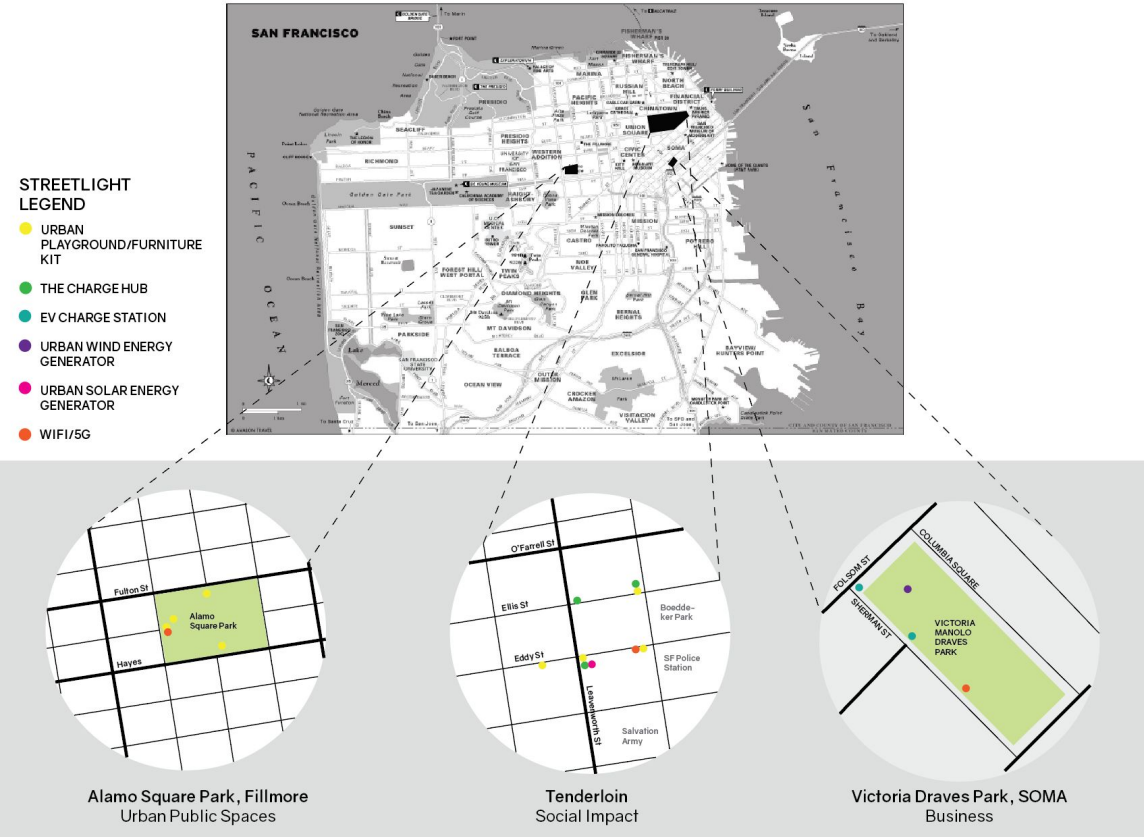

Urban Furniture
Urban Play
EV Charging
Charging Station
Wind Energy Generator
Solar Energy Generator



Streetlight kit of parts

STRATEGIC PLACEMENT

Streetlight kit of parts are customized and placed in strategic areas of the city, accommodating for current and future populations.



Alamo Square Park, Fillmore
Urban Public Spaces

Tenderloin
Social Impact

Victoria Draves Park, SOMA
Business

Alamo Park and Victoria Draves Park - *Urban public spaces*
Alamo park has been identified as a prime location to further activate the community. By expanding the use case of these streetlights, we aim to encourage parents and children to spend more time outdoors, and invite the residents to interact with this public space.

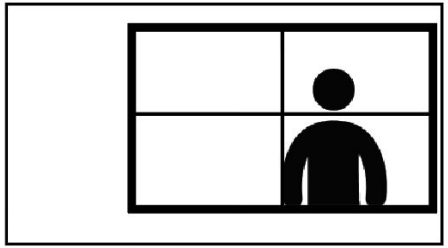
Tenderloin - Social Impact
In 2015, San Francisco Chronicle estimated approximately 6,686 homeless are on the street of San Francisco. Homeless people cost the city $150 Million in the emergency health care per year. The Tenderloin neighborhood is home to San francisco's largest homeless population as well as numerous non-profit organizations that support them. Majority of the homeless in San Francisco have mobile phones as a means to connect with the resources available to them. However, access to power outlets and wifi is limited. The StreetLight kit of Parts will be available in strategically selected locations to ensure this community has access to all of the services they need.

Victoria Draves Park, SOMA - Business
In our business district, we are placing EV chargers to serve the financial community as well as wind energy generator to take advantage of the tall skyscraper landscape. Charging stations are also placed to serve busy passerbys.

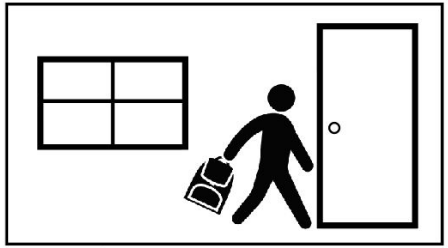
Streetlight kit of parts

Alamo Square Park, Fillmore

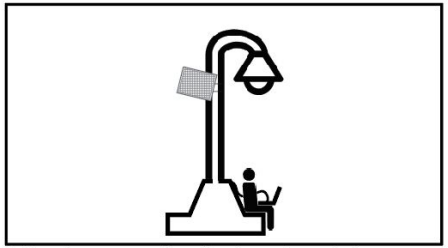
Eddy and Leavenworth, Tenderloin



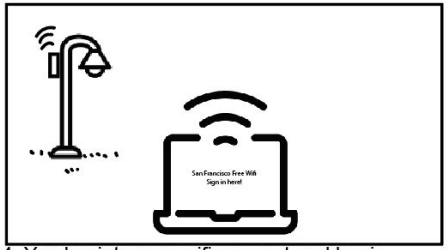
1. You are sitting at your home office, looking out the window, wishing you could work outside.



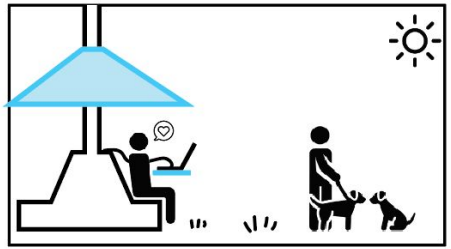
2. So you throw on your backpack and head out to Alamo Square



3. You have a seat on the bench and plug your laptop in.



4. You log into your wifi account and begin work



5. Enjoying the nice weather and getting work done!

STAKEHOLDER INTERVIEW

San Francisco | April 2017

“I would love to work outdoors. I wish something like this existed at Dolores Park.”
-Candelaria 28 y/o Freelance Designer

“Every time the weather is nice outside, I look out the window and wish I could work outside.”
-Roberto 36 y/o CMO

5.
Business Case

VALUE PROPOSITION

Through utilization of existing resources we will provide **connectivity** to city residents, **revitalize communities** through engagement with nature, and make **resources** available to those who need it most.

Connectivity

→ Reliable Wifi
→ Access to electricity
→ Renewable Energy source

Convenience

→ City wide coverage
→ Opportunity to work outside

Community Engagement

→ Encourage people to interact

SOCIAL IMPACT

Through the use of creative and playful furniture we aim to contribute to the landscape of the city and promote community engagement. We also aim to contribute to the already existing landscape of resources in place for the homeless population of San Francisco.

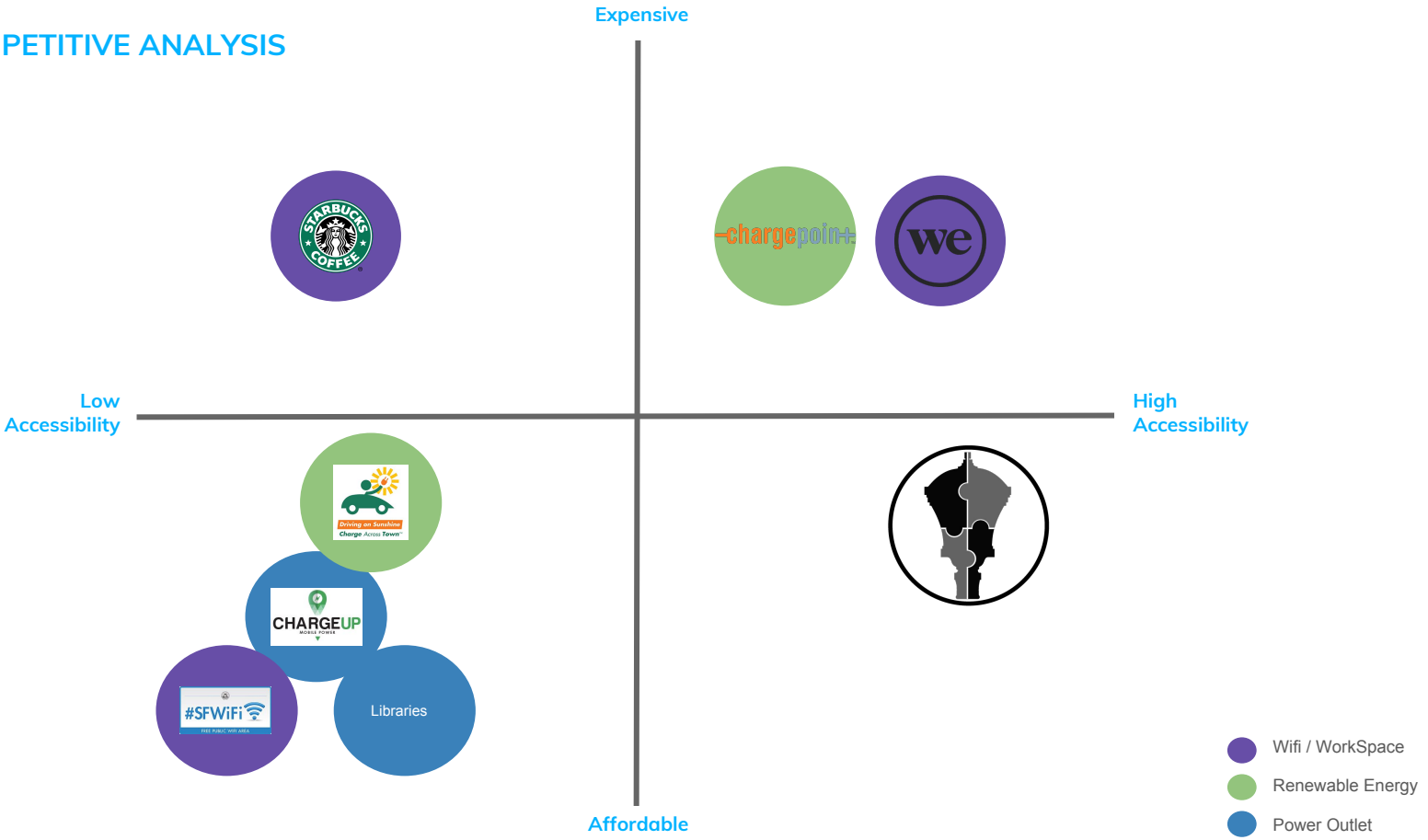
COMPETITIVE LANDSCAPE

City of San Francisco currently offers free EV charging stations, Wifi, and electronic outlets in specific areas through city funded projects and/or private partnerships. However, no organization currently offers multi-functional services utilizing existing city assets and sustainable power generation systems.

Also existing services' accessibility are low which only benefits limited stakeholders passing by. Besides bringing resources to the residents, this solution will increase the value of the property of its location.

We identified existing services in San Francisco such as conventional gas stations, Chargepoint, Driving on sunshine program, SFWIFI, co-working spaces, and ChargeUp are the potential competitors of Street light kit of parts and summarized our findings in the competitive analysis map.

COMPETITIVE ANALYSIS



COMPETITIVE ADVANTAGE

ACCESSIBILITY

Wide range of **essential** services and making it easily **accessible**

FLEXIBILITY

Kits are **compatible** with all **existing** streetlights regardless of typology

UNIQUENESS

Flexible and **unique** business model

COMPETITIVE ADVANTAGE

We believe that the advantages of Streetlight Kit of Part is in its flexibility and unique business model application. The kits are compatible with all existing streetlights regardless of their typology. This model gives us flexibility to customize kits in different areas.

We also promise a wide range of services that many competitive services seem to be struggling to attain. In addition to the highly flexible service offerings and placement, use of sustainable energy source would make Streetlight Kit of Parts' unique to the customers as well.

Providing these services will contribute to property value in underdeveloped areas of the city. By expanding the use of existing 46,000 streetlights, we believe this project will generate economic benefits to local government, and businesses.

BUSINESS MODEL

Customer Segment

City Dwellers

Remote workers

Owners of Electric Vehicles

Working Parents

Homeless community

Partners

Google Project fi for Wifi

Plugshare

SolarCity

The city of SF

Street Light owner company

BUSINESS MODEL

Cost Structure

Pole rental (per year): $3,000 - 4,000

Hardware (per pole):

Wifi:	$800
Solar:	$200
Wind:	$950
Outlets:	$500
EV charger:	$1,500

Maintenance (per month): $100
Insurance (per pole/month): $50

Revenue Stream

Wifi: First 30 minutes/day are free
Additional use is $30/month

Outlets: First 10 minutes/day are free
Additional use is per kWh

EV charging: Use is charged per kWh
Markup for social impact

6.
SROI

Through the use of our streetlight kit, we are creating an additional role for the streetlight that goes beyond these invisible urban luminaires.

By increasing opportunities for public space with interjections of urban engagement areas through our urban play and urban furniture kit, we are introducing micro moments of public space by using spaces around streetlights that are often unused. This can lead to a higher quality public environment which can have impact on the economic life or urban centers both big and small.

As cities increasingly compete with each other to attract investment, the presence of public space becomes a vital business and marketing tool, attracting companies, retail, and families. This in turn can increase real estate value and promote public safety. Additionally, by promoting more places of play has a significant impact on health. The increase of technology has had an inevitable increase into sedentary lifestyles. It is more important than ever to provide people with opportunities for recreation however large or small.

SOCIAL VALUE PROPOSITION

Our EV Charging station kits allow for increased resources for future sustainable vehicles can push for a more sustainable city and promote electric vehicle use in cities. Currently battery-powered electric vehicles are poised to change the social, political, and economic landscape and San Francisco needs to be at the forefront of these technology, showing that they are invested in more sustainable technologies.

Our solar and wind kits can additionally benefit the city by allowing new opportunities for renewable energy generation, powering charging stations throughout the city which can help underserved populations to participate in society through use of electronics.

THEORY OR CHANGE

Our theory of change is invested in the future of the city where we need to consider realistic ways our cities can evolve to accommodate for increasing population, smaller spaces, and decreased open spaces in urban areas. By proposing the strategic kit of parts, we can move streetlights into a more engaged and sustainable role in urban futures.

Instead of being just providers of safety, that it can be seen as a new form of real estate, which can provide small opportunities of urban vitalities wherein cramped urban cities cannot afford.Through utilization of existing resources we will provide connectivity to city residents, revitalize communities through engagement and play, and make resources available to those who need it most.

THEORY OF CHANGE

Needs	If...	Then (Short Term)	Then (Long Term)
High cost of streetlight maintenance and energy cost Increased need for **public space** Increased **need** for **public charging stations** with increased use of technology Increase of **electric** vehicles **Safety** and **security**, people to self monitor their own neighborhoods	Strategically place streetlight kits to provide public spaces, charging stations, renewable energy charging, and access to internet	Provide **additional** public space which leads to safer and more engaged streets Provide city with more **renewable** energy resources Increase use of electric vehicles Increased **resources** for **underserved** communities Communities to make additional **income**	Higher **real estate** value **Safer** streets Increased opportunity for **homeless** population with tech resources, which can lead to **better jobs** and housing **opportunities** and **connectivity** to rest of society **Connecting people to nature**

IMPACT VALUE CHAIN

The impact value chain illustrates how we will change the city and owner's attitudes towards an adaptive reuse of streetlights. Providing these kits, which are adoptable to any city infrastructure, we stand to impact all cities and revitalize any urban area in any context.

Inputs

- Capital
- Staff
- Time
- Expertise (Product, policy, legal, engineers, urban planning, manufacture)
- Influence through partnership
- City and neighborhood buy in

Activities

- Build and test products
- Research
- Marketing
- Partnership negotiations
- Community and neighborhood engagement

Outputs

- Cities approved for streetlight kit of parts
- Communities purchasing streetlight kit of parts
- Site traffic

Outcomes

- Increased public space
- Increased real estate value
- Increased resources for homeless population
- Increased electric vehicles
- Reduced cost of streetlights for cities

QUANTIFICATION OF SOCIAL IMPACT

→ Internet service

- More than 100,000 San Francisco residents do not have access to the Internet at home, including 14 percent of public school students
- How many users are taking advantage of the freemium model on a regular basis?

→ Energy services

- Approximately 3,000 homeless persons in San Francisco have cell phones
- How much energy is generated where and when?
- How much energy is used where and when?

**Product deployment may need to be adjusted based on use

MONETIZATION OF SOCIAL VALUE

→ It costs taxpayers about **$31k f**or a homeless person on the street. If we were to provide resources for them to access jobs, health, and housing resources, **we can decrease the perpetual cost by 40%**

→ The number one reason for homeless people to lose their homes and jobs is accountability. If we increase their visibility, we stand to reduce costs for taxpayers about **$20k** per homeless person which equates to about **$80M** for the city of San Francisco

→ Estimated that for every square foot of public space added, increases adjacent property $**21 p**er square foot. If we were to consider 30% of the area around streetlights to be public space could add over **$8.3M** to SF real estate value

POTENTIAL CHALLENGES

Risk of Vandalism

Lack of Utilization

NIMBYism

Government Bureaucracy

NEXT STEPS

- De-risk our challenges
- Partnership
- Build Physical Prototype
- Validate Business Model
- Test & Iterate
- Develop comprehensive Business Plan
- Funding
- Build MVP

THANKS!

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APPENDIX

Expert interviews

Jack Dumbacher
PhD Biologist Curator of Ornithology and Mammalogy at California academy of Science

Laura Tam
Sustainable Development Policy Director at SPUR

Travis Longcore
Ph.D., GISP Sustainable Development Policy Director at USC

Brian Lakamp
Founder & CEO of TOTEM

Resources

City gas stations dwindle in real estate boom
http://www.sfgate.com/bayarea/article/City-gas-stations-dwindle-in-real-estate-boom-5802981.php

Driving on sunshine program
http://www.chargeacrosstown.com/driving-on-sunshine/

Charge point X BMW
https://www.chargepoint.com/about/news/chargepoint-partners-bmw-san-francisco-electric-vehicle-car-sharing-service/

City free EV charging station at Treasure island
http://sftreasureisland.org/free-island-electric-vehicle-charging-stations

Phone-charging stations become public squares
http://www.sfgate.com/technology/article/Phone-charging-stations-become-public-squares-4650448.php

ChargeUp
http://www.neutralground.com/chargeup

Google provides Wifi in SF parks
http://www.nbcbayarea.com/news/tech/Google-Sponsors-Free-Wi-Fi-in-San-Francisco-Parks.html

SF Free Wifi
http://sfgov.org/sfc/sanfranciscowifi

Map
http://sfgov.org/sfc/sites/default/files/San%20Francisco%20WiFi/Free%20Wi-Fi%20Site%20List_30sept2014v3.pdf

San Francisco Free Wi-Fi Gradually Eliminated At Hottest Cafes
http://www.huffingtonpost.com/2013/02/19/the-end-of-free-wi-fi_n_2720280.html